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# **Interventions to increase condom use among middle-aged and older adults: A systematic review of theoretical bases, behaviour change techniques, modes of delivery, and treatment fidelity**

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## **Abstract**

This systematic review collates, examines, and synthesises condom use interventions for middle-aged and older adults. Associations between effectiveness and theoretical basis, behaviour change techniques [BCTs], mode of delivery, and treatment fidelity were explored. Five interventions were included; one was effective. Compared to interventions with non-significant findings, the effective telephone-administered intervention used theory to a greater extent, had a higher number of BCTs, and employed more treatment fidelity strategies. There is a need to develop theory-based interventions targeting condom use among this population and evaluate these in randomised controlled trials that are rigorously designed and reported. Health psychologists have a key role in this endeavour.

## **Introduction**

### **Rationale**

Worldwide, the population is growing older; a trend that is set to endure (United Nations, 2009). In a United Kingdom [UK] context, the Office for National Statistics (ONS, 2013) recently reported record life expectancy at birth for men, 79 years, and for women, 83 years. Alongside these demographic shifts, divorce in later life has increased. In the United States [US], divorce rates in adults aged 50 years and above doubled between 1990 and 2010 (Brown & Lin, 2012), and in the UK, the number of divorces in 2012 was highest among 40 to 44 year olds (ONS, 2014). Thus, considerable numbers of middle-aged and older adults are re-entering the dating arena and starting new relationships (Idso, 2009). A contemporary large-scale survey of adults aged between 57 and 85 years from the US demonstrated that a high proportion (51%) were sexually active in the previous year (Lindau et al., 2007). Furthermore, The Global Study of Sexual Attitudes and Behaviour, which sampled 27,500 adults between 40 and 80 years from 29 countries, including the UK and 8 others within Europe, revealed that sex was perceived as essential to maintain a relationship by 82% of men and 76% of women (Nicolosi et al., 2004).

There is, however, evidence that a substantial minority of middle-aged and older adults engage in sexual behaviours that place them at risk of sexually transmitted infections [STIs], including HIV (see Gott, 2004 for an overview). For example, in a UK study of 319 adults between 50 and 90 years of age, 21 individuals (7%) reported having had more than one partner in the previous five years, but not consistently using condoms (Gott, 2001). Condoms may not be used as they become irrelevant for contraceptive purposes and as middle-aged and older adults tend to have poor knowledge of sexual health issues, they may believe that STIs, including HIV, only affect their younger counterparts (Family Planning

Association [FPA], 2010). Other potential contributors to sexual risk-taking among middle-aged and older adults include: difficulties applying a condom due to age-related medical conditions like erectile dysfunction (Kuehn, 2008); healthcare professionals' failure to proactively approach sexual health management in mid and later life; and middle-aged and older adults' tendency not to seek help for sex-related concerns (Hinchliff & Gott, 2011).

The Centers for Disease Control and Prevention [CDC] (2012) reported that cases of chlamydia among 45 to 64 year olds from the US rose by 45% between 2008 and 2012, from 18,222 to 26,405, with a similar number of cases evident in men and women. However, in 2010, the estimated number of HIV diagnoses in adults aged 50 to 54 years was 2,730 and 941 for men and for women, respectively. In all males over 50 years, HIV was largely transmitted among men who have sex with men [MSM] and individuals from non-white populations (CDC, 2013).

The latest sexual health surveillance data from England showed that in 2013, the number of 45 to 64 year olds diagnosed with chlamydia was 3,483 among men and 1,522 among women (Public Health England [PHE], 2014a). Between 2009 and 2013, diagnoses of gonorrhoea increased in this age group by 114% (from 1,155 to 2,475); across all years, males accounted for approximately 89% of cases (PHE, 2014b). Although it was not possible to determine the proportion of chlamydia cases according to sexual orientation, higher numbers of diagnoses of gonorrhoea among men were attributable to the inclusion of MSM. Furthermore, the number of HIV diagnoses in adults over 50 years more than doubled from 442 in 2002 to 990 in 2012; akin to the US, the vast majority of these were among MSM and people from black African communities (PHE, 2013). Although, overall, younger people are still the predominant group affected by STIs, including HIV, the rapid rise of diagnoses in middle-aged and older adults is a growing concern.

Current government policies and services in England (and in each devolved UK nation) that aim to reduce transmission of STIs, including HIV, and promote sexual well-being are not generally tailored for the specific needs of middle-aged and older adults (Bodley-Tickell et al., 2008; FPA, 2011); a scenario echoed internationally (Linsk, Fowler, & Klein, 2003; Levy, Ding, Lakra, Kostead, & Niccolai, 2007). Moreover, the impact of interventions that promote condom use has been shown to be reliant on a number of population-specific factors, including age (Albarracín et al., 2005), which suggests that the transferability of evidence between age groups is problematic.

Davis and Zanjani (2012) conducted a systematic review of HIV prevention in adults over 50 years from 1996 to 2011, capturing the post-HAART (highly active antiretroviral therapy) era literature. Eighteen relevant articles were included; however, 10 concerned discussions of *possible* prevention strategies. Of the intervention studies identified, five attempted to increase HIV knowledge and three targeted condom use. Although Davis and Zanjani (2012) concluded that the condom use interventions demonstrated some evidence of sexual risk-reduction, the broad nature of the review meant that a detailed interrogation of these interventions, the methodologies they employed and their effectiveness, was not undertaken. The current review addressed this omission and extended coverage to condom use interventions framed in the context of sexual health and STIs more broadly.

Recent advancements in behavioural medicine have included the development of tools to assess the theoretical bases (Michie & Prestwich, 2010) and treatment fidelity (Borrelli et al., 2005; Borrelli, 2011) of interventions, and a multidisciplinary and internationally accepted standardised vocabulary to categorise intervention content into behaviour change techniques [BCTs] (Michie et al., 2011; Michie et al., 2013). These tools

are of value in systematic reviews as they facilitate detailed comparisons across studies and enable elucidation of the core intervention components associated with effectiveness.

As such, this review updated and developed that of Davis and Zanjani (2012) with the addition of one study that evaluated a condom use intervention for middle-aged and older adults and the use of cutting-edge instruments to code core intervention components and provide insight in to factors that influence intervention outcomes.

## **Objective**

To identify and describe the existing evidence base of condom use interventions for middle-aged and older adults (defined here as over 40 years), synthesise their findings, and evaluate their effectiveness.

## *Research questions*

- What are the core components (i.e. setting, intensity, frequency, duration, theoretical basis, BCTs, mode of delivery, interventionist characteristics, and treatment fidelity) of condom use interventions for middle-aged and older adults?
- Are condom use interventions for middle-aged and older adults effective?
- What are the associations between effectiveness and theoretical basis, BCTs, mode of delivery, and treatment fidelity?

## **Methods**

### **Protocol and registration**

The review followed a published protocol (MacDonald, Lorimer, Knussen, Donald, & Flowers, 2012) and the PRISMA guidelines (Moher, Liberati, Tetzlaff, Altman, & The PRISMA Group, 2009).

### **Eligibility criteria**

Studies were required to be available in English and published after 2000, because until then, most sexual health research related to middle-aged and older adults concerned primary observational and exploratory studies.

### *Participants*

Studies of adults over 40 years were considered regardless of gender identity, sexual orientation, STI history, HIV status, race/ethnicity, nationality, socioeconomic status, marital status, or educational status. This inclusive approach was chosen to reflect the commonality of life course position and represents the opposite end of the age spectrum to studies of younger people. Studies with a subsample of adults over 40 years were included if: firstly, the authors indicated that the intervention was tailored for the unique needs of this population and secondly, the data were analysed according to age. Studies that focused exclusively on commercial sex workers, victims of sexual or domestic abuse or violence, intravenous drug users, those in prison, psychiatric facilities or nursing homes, or individuals with no fixed address were excluded; these groups have distinct needs beyond the scope of the review.



### *Interventions (including control and study design)*

All types of interventions targeting condom use with at least one follow-up from baseline were considered. Only randomised controlled trials [RCTs] or controlled clinical trials [CCTs] were included.

### *Outcomes*

Several health behaviour theories propose that intention is the most proximal determinant of behaviour (Webb & Sheeran, 2006) and it is often used as the dependent variable in research (Armitage & Conner, 2000); thus, studies were included if they reported condom use intentions and/or behaviour. In recognition of other important dimensions of sexual health (Bailey et al., 2010), the following outcomes were recorded when available: condom carrying, negotiation/communication skills, HIV/STI incidence or prevalence, HIV/STI knowledge, condom application skills, condom use self-efficacy, condom-related attitudes or beliefs, risk perception, and cost-effectiveness.

### **Information sources and search**

Five databases were searched: CENTRAL; CINAHL; EMBASE; PsycINFO; and MEDLINE. The British Library EThOS, OpenGrey, and PQDT Open were searched to identify grey literature (dissertations and theses). Manual searching of the reference lists of studies included in the review was also conducted. All searches were conducted during June 2014. Relevant subject headings and keywords were identified from a scoping search of PsycINFO and a Cochrane review of condom use interventions (Carvalho et al., 2011). Subsequent searches were broadly similar across databases; however, modifications were made to account for minor differences in index terms and standard search symbols, and grey literature searches were

limited to keywords in relation to sexual behaviour. The PsycINFO search strategy is available in Appendix A (supplementary file).

### **Study selection**

The titles and abstracts of identified papers were screened. If insufficient detail was available to make an informed judgement on relevance to the review, the full text was retrieved and two independent reviewers determined eligibility. One disagreement was recorded; this was resolved by emailing the corresponding author who provided outcome data related to condom use intentions, which had been analysed with other measures to reflect broader behavioural intentions (Swartz et al., 2011). Manual searching of the reference lists of included studies was then completed (see Figure 1).

### **Data collection process**

Key details of included studies were extracted by two independent reviewers using a structured review-specific data extraction form (adapted from checklists by the Centre for Reviews and Dissemination [CRD], 2009; Higgins & Deeks, 2011; the Scottish Intercollegiate Guidelines Network [SIGN], 2011), which was refined after pilot testing with one paper. Disagreements about extracted data were few and resolved through discussion. Two attempts were made to contact the corresponding author of each paper via email to request additional information. A full manual was obtained for one included study (Lovejoy et al., 2011), which in combination with a published detailed description of each intervention session (Lovejoy, Heckman, & The Project SAFER Intervention Team, 2014), was used for data extraction and coding.

## **Data items**

Information was captured from included studies in relation to participants (including age, gender, ethnicity, and sexual orientation), core intervention components (including theoretical basis, BCTs, mode of delivery, and treatment fidelity), and outcomes (including operationalisation and results).

## *Coding*

The first 11 items of the 19-item Theory Coding Scheme [TCS] (Michie & Prestwich, 2010) were used to assess how theory and predictors (constructs not explicitly linked to a theory by authors but targeted because they relate to behaviour) informed intervention development. Items 12 to 19 were not evaluated because they pertain to methodological issues associated with theory testing and whether theory was refined on the basis of results. Items were summed to create an overall 'use of theory' score, which was converted to a percentage to reflect the number of items each intervention endorsed. A higher percentage indicated more extensive use of theory. Theory coding was completed by two independent reviewers and decisions discussed until consensus was reached. Inter-rater reliability assessed by Cohen's kappa ( $k$ ) statistic was .64; a  $k$  value between .61 and .80 reflects 'substantial' agreement (Landis & Koch, 1977).

Descriptions of intervention content were coded into BCTs using the 93-item Behaviour Change Technique Taxonomy v1 [BCTT] (Michie et al., 2011; Michie et al., 2013). Two reviewers independently coded BCTs then discussed their presence/absence ( $k = .71$ ); BCTs not previously coded by either reviewer were occasionally identified from such discussions. Where the same BCT was coded in relation to the same target behaviour in descriptions of intervention and control content i.e. overlapping BCTs, this BCT was

subtracted from the total number of BCTs for that intervention and did not count towards BCT frequency among interventions. Expert opinion (Hardeman & Johnston, personal communication) was sought in four instances when differences were not resolved through discussion.

A 30-item Treatment Fidelity Checklist (Borrelli, 2011) adapted from a tool developed by Borrelli et al. (2005) was used to assess whether treatment fidelity strategies were in place with regard to: study design; interventionist training; treatment delivery; treatment receipt; and treatment enactment. Percentage scores for each area reflected the proportion of items with evidence of at least one treatment fidelity strategy. An overall summary score of  $\geq 80\%$  represented an intervention with high treatment fidelity (Borrelli et al., 2005). Treatment fidelity coding was completed by one reviewer and discussed with a second reviewer until agreement was reached.

### **Assessment of risk of bias**

Risk of bias was assessed using a structured tool based on content from published instruments (Downs & Black, 1998; Effective Public Health Practice Project, 1998; CRD, 2009; Higgins, Altman & Sterne, 2011; SIGN; 2011); selection, performance, detection, attrition, and reporting biases were covered. Summary assessments of risk of bias (low, moderate, or high) were then determined for each outcome within studies. Risk of bias was completed by one reviewer and discussed with a second reviewer, after which slight changes were made. Studies were not excluded on the basis of their risk of bias; however, coupled with study design, it determined the level of evidence the study provided (see SIGN, 2011).

## **Data synthesis**

Owing to heterogeneity in participants, modes of delivery, and outcomes, it was not considered statistically appropriate to conduct a meta-analysis. Consequently, results were synthesised in a systematic descriptive form, which was guided by the ESRC Methods Programme general framework for narrative synthesis (see Popay et al., 2006).

## **Results**

### **Study selection**

Four studies fulfilled the eligibility criteria<sup>1</sup> (Coleman et al., 2009; Illa et al., 2010; Lovejoy et al., 2011; Swartz et al., 2011). One study tested two interventions (Lovejoy et al., 2011); thus, the review comprised five interventions.

[FIGURE 1.]

### **Study characteristics**

#### *Participants*

Table 1 contains details of the participants of the four included studies. All studies were conducted in the US. The studies had a total of 565 participants; the number of participants in each study ranged from 60 (Coleman et al., 2009) to 241 (Illa et al., 2010). Participants varied in age from 40 years and above (Swartz et al., 2011), to 45 years and above (Illa et al., 2010; Lovejoy et al., 2011), to 50 years and above (Coleman et al., 2009). Three studies recruited participants living with HIV (Coleman et al., 2009; Illa et al., 2010; Lovejoy et al.,

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<sup>1</sup> An article by Echenique et al. (2013) also fulfilled the eligibility criteria, but a decision was made to exclude this as the authors were reporting the outcomes specific to female participants from the study of Illa et al. (2010). The intervention did not meet the review criteria for effectiveness in either paper.

2011). Illa et al. (2010) sampled participants who were largely male (56%), heterosexual (85%), and from ethnic minority groupings (92% - mainly African-American). Most participants (87%) in the study of Lovejoy et al. (2011) also identified as an ethnic minority (primarily African-American) and 44% were MSM, 44% were women, and 12% were heterosexual men. In contrast, Coleman et al (2009) only sampled African-American MSM; 28% identified as bisexual or heterosexual/unsure. Finally, Swartz et al (2011) recruited heterosexual females (76% White).

[TABLE 1.]

### *Interventions*

The main components of the five interventions identified are presented in Table 1 (excluding theoretical basis, BCTs, and treatment fidelity). The interventions were delivered face-to-face using a group format in classroom-like (Coleman et al., 2009) or clinic (Illa et al., 2010) settings, or on an individual basis using distance technologies i.e. the telephone (Lovejoy et al., 2011) or the Internet (Swartz et al., 2011). The intensity, frequency, and duration of the interventions also varied; for example, Coleman et al. (2009) delivered their intervention in four two hour sessions over four weeks, Illa et al. (2010) delivered their intervention in four sessions that ranged from one hour to two hours 30 minutes, Lovejoy et al. (2011) delivered their interventions in four sessions that were spaced one week apart and totalled, on average, two hours 43 minutes or in a single-session of approximately 48 minutes, and Swartz et al. (2011) reported that the average length of their intervention was 67 minutes. Interventionists were either an older, Masters qualified, African-American with experience working with HIV prevention in African-American communities (Coleman et al.,

2009) or Psychology trainees with knowledge of client-centred therapies (Lovejoy et al., 2011). Illa et al. (2010) did not provide details of their interventionist(s) while Swartz et al. (2011) delivered their intervention online so did not require an interventionist.

### *Use of theory*

Table 2 (supplementary file) contains details related to the theoretical bases of the five interventions. All authors mentioned a model of behaviour change and used theory, or theory and predictors, to select or develop BCTs. Theories included the Theory of Planned Behaviour (Ajzen, 1991), Social Cognitive Theory (Bandura, 1986), the Information, Motivation and Behavioural Skills Model (Fisher & Fisher, 1992), the Transtheoretical Model (Prochaska & DiClemente, 1992) and the Theory of Gender and Power (Connell, 1987). In four intervention descriptions (Illa et al., 2010; Lovejoy et al., 2011; Swartz et al., 2011), at least one, but not all, BCTs were explicitly linked to at least one theory-relevant construct/predictor and at least one, but not all, theory-relevant constructs/predictors were explicitly linked to at least one BCT. The extent to which theory was used in the development of interventions, as measured by the TCS (Michie & Prestwich, 2010), ranged from 18% (Coleman et al., 2009) to 64% (Lovejoy et al., 2011).

### *Behaviour change techniques*

Twenty-seven BCTs were identified across the five interventions - see Table 3 (supplementary file). The mean (SD) number of BCTs coded per intervention was 10 (4.53), with a range of four (Swartz et al., 2011) to 15 (Lovejoy et al., 2011; four-sessions). The most frequently occurring BCT was 'problem solving', which was coded in four interventions

(80%). Three BCTs were coded in three interventions (60%): ‘information about social and environmental consequences’, ‘reduce negative emotions’, and ‘pros and cons’.

### *Treatment fidelity*

Table 4 (supplementary file) shows the treatment fidelity of the five interventions. Summary scores of treatment fidelity ranged from 23% (Illa et al., 2010) to 68% (Lovejoy et al., 2011; four sessions); thus, no intervention had a high ( $\geq 80\%$ ) treatment fidelity rating overall.

Studies that scored higher in design (Coleman et al., 2009; Lovejoy et al., 2011) gave detailed accounts of treatment dose and incorporated methods such as a scripted manual and noting session length to ensure correct dosage. Coleman et al. (2009) and Lovejoy et al. (2011) also referred to interventionist training; strategies to assess skill maintenance included monitoring for protocol adherence, audio-recording sessions, and supervision.

Although treatment fidelity in relation to intervention delivery was poorly addressed across most studies, it was covered in detail by Lovejoy et al. (2011). Strategies included interventionist checklists to delineate the BCTs used in each session and reviewing audio-recordings with interventionists. Coleman et al. (2009) and Illa et al. (2010) gave the most consideration to intervention receipt. Tactics to improve participants’ understanding of intervention-related cognitive and behavioural skills included delivering information in multiple formats and role-playing scenarios.

Excluding the single-session intervention of Lovejoy et al. (2011), evidence of at least one strategy to enhance treatment enactment, such as practising condom use and troubleshooting difficulties, was established in each intervention.



## *Outcomes*

All studies measured outcomes using self-report at both baseline and follow-up, which ranged from 30 days to six months (see Table 1). Swartz et al. (2011) measured condom use intentions. The remaining three studies measured condom use behaviour, which varied with regard to the following: recall period i.e. questions asked about the previous three months (Coleman et al., 2009; Lovejoy et al., 2011) or six months (Illa et al., 2010); measure type i.e. consistent/inconsistent condom use (Coleman et al., 2009; Illa et al., 2010) or frequency of condom use (Lovejoy et al., 2011); and sexual act specificity i.e. anal sex (Coleman et al., 2009), anal and vaginal sex (Lovejoy et al., 2011), or anal, vaginal, and oral sex (Illa et al., 2010).

Illa et al. (2010) reported HIV knowledge and 'safe sex' self-efficacy. Despite the authors' efforts, it was not possible to analyse data from items that Swartz et al. (2011) used to assess STI prevention knowledge and perceived importance of condom use to prevent STIs.

## **Risk of bias**

Table 5 (supplementary file) details the risk of bias for each outcome within included studies and the level of evidence provided by each study. Risk of bias varied within studies: low (Coleman et al., 2009; Lovejoy et al., 2011); moderate (Swartz et al., 2011); and high (Illa et al., 2010). As an RCT with low risk of bias, the highest level of evidence was provided by Lovejoy et al. (2011).

All studies were described as RCTs; however, Coleman et al. (2009) allocated participants on an 'every other person' basis, so their study was downgraded to a CCT (see SIGN, 2011). Two studies (Illa et al., 2010; Swartz et al., 2011) did not report sequence

generation and measures to ensure adequate allocation concealment; Lovejoy et al. (2011) provided information about both. Coleman et al. (2009) and Lovejoy et al. (2011) achieved comparable conditions at baseline for most variables (see Table 1). Illa et al. (2010) and Swartz et al. (2011) only provided baseline data for participants who completed follow-up or received their allocated condition, respectively. Illa et al. (2010) reported that dropouts did not differ from those in the same condition who remained in the study and baseline data suggested intervention and control groups were similar.

Coleman et al. (2009), Illa et al. (2010), and Swartz et al. (2011) included control conditions that incorporated some intervention components (see Table 1). Lovejoy et al. (2011) encouraged participants in their control group to obtain information and support from local services and attempted to monitor use of these by referring interested participants. Blinding of outcome assessors was sufficiently covered by Lovejoy et al. (2011) and Swartz et al. (2011). It was unclear who collected data for the remaining two studies.

Coleman et al. (2009) reported that all participants received their allocated condition and completed follow-up. Lovejoy et al. (2011) noted differences in treatment completion but reasons were provided and an intention-to-treat analysis conducted. Illa et al. (2010) had unequal dropouts between conditions, but it remains unknown when and why participants left the study. Information on treatment completion, attrition and exclusions was inadequate in the study by Swartz et al. (2011) and a true intention-to-treat analysis was not executed. Illa et al. (2010) stated that a 12 month follow-up was conducted but only reported shorter-term outcome data.

## **Results of individual studies**

Interventions were considered effective if they increased condom use intentions or behaviour at follow-up and differences between intervention and control conditions were statistically significant in favour of the intervention (see Table 1).

Swartz et al (2011) reported that condom use intentions increased in the intervention group; however, they were not significantly greater than in the control group. Therefore, the intervention was not effective according to review criteria.

One intervention that targeted condom use behaviour met the review criteria for classification as effective (Lovejoy et al., 2011; four-sessions). Although instances of unprotected sex decreased in all conditions, there were significantly fewer instances of unprotected sex in the four-session intervention group compared to the control group (and the single-session intervention group). The single-session intervention group did not significantly differ from the control. Coleman et al. (2009) reported a significant increase in consistent condom use in both the intervention and control group; however, there was no significant difference between conditions. Illa et al. (2010) found a significant decrease in inconsistent condom use in the intervention group. Although inconsistent condom use was less prevalent than in the control condition, the authors did not conduct a between-group analysis.

Illia et al. (2010) reported that HIV knowledge significantly increased in both intervention and control conditions; 'safe sex' self-efficacy did not improve for either group.

### *Effectiveness and core intervention components*

As only one intervention was deemed effective according to review criteria, comparisons of the theoretical bases, BCTs, modes of delivery, and treatment fidelity of interventions with significant and non-significant results could not be conducted using statistical analyses.

The effective intervention (Lovejoy et al., 2011; four-sessions) had a 'use of theory' score of 64% compared to the mean score of 39% (SD = 19) of the four interventions with non-significant results. Having a single theory as a basis, using theory to select participants, and using theory to tailor BCTs were identified as the most effective ways for theory to inform intervention development - see the far right column of Table 2 (supplementary file).

'Review behaviour goal' was the only BCT unique to the effective intervention. From the other 26 BCTs coded across all interventions, the following 11 had a success rate of 50%: 'monitoring of behaviour by others without feedback'; 'incompatible beliefs'; 'goal setting (behaviour)'; 'action planning'; 'verbal persuasion about capability'; 'salience of consequences'; 'focus on past success'; 'comparative imagining of future outcomes'; 'commitment'; 'framing/ reframing'; and 'paradoxical instructions' (see the far right column of Table 3 - supplementary file). Fifteen BCTs were coded in the effective intervention compared to a mean (SD) of 8.75 (4.11) in the four interventions with non-significant results.

Using the telephone to administer interventions had a success rate of 50% compared to using the internet or traditional face-to-face contact, both of which yielded non-significant results. Interventions delivered to individuals had a success rate of 33% compared to interventions delivered in group format, which did not produce significant findings (see Table 1).

Finally, the effective intervention had an overall treatment fidelity rating of 68% compared to the mean rating of 45% (SD = 18.71) of the four interventions with non-significant findings - see Table 4 (supplementary file).

## **Discussion**

### **Summary of evidence**

There is currently little evidence that condom use interventions for middle-aged and older adults are effective, as only one of the five included interventions showed a significant effect. Compared to the four interventions with non-significant findings, the effective telephone-administered intervention used theory to a greater extent, had a higher number of BCTs, and employed more treatment fidelity strategies (although it was not possible to test whether differences were statistically significant). 'Review behaviour goal' was the only BCT unique to the effective intervention but 11 other BCTs were identified as effective 50% of the time.

### *Critical analysis of included studies*

Although all studies were described as RCTs, one was downgraded to a CCT (Coleman et al., 2009) due to non-random sequence generation. Risk of bias varied across studies; half were considered moderate or high risk. Future studies should ensure risk of bias is well covered and that steps taken to do so are clearly reported.

Lovejoy et al. (2011) based their sample size on the results of power analysis; thus, recruitment was adequately planned for detecting differences. Conversely, Coleman et al. (2009) recruited enough participants to test feasibility and acceptability so it is possible that their study was not sufficiently powered to detect treatment effects. The remaining two

studies recruited the highest number of participants, but neither referred to sample size determination. The importance of this has been widely asserted; it avoids underpowered studies and exposing too many participants to new treatments (Charles, Giraudeau, Dechartres, Baron, & Ravaud, 2009). As such, it would be advantageous for authors of future intervention work to ensure that reporting of sample size calculation is transparent.

All studies were conducted in the US and with the exception of that of Swartz et al. (2011), were largely concerned with secondary HIV prevention for ethnic minority men. Research focussing upon condom use interventions in relation to other aspects of sexual health among middle-aged and older adults was lacking. Moreover, the generalisability of findings to the ageing HIV-positive population is questionable; MSM were under-represented in the studies of Lovejoy et al. (2011) and Illa et al. (2010). Further research is needed that explores condom use in middle-aged and older adults in relation to health inequalities (by ethnicity, sexual orientation).

Studies were also restricted in that they had short- or medium-term follow-ups and relied on heterogeneous self-report outcome measures, which hindered comparisons between studies. Future efforts should evaluate condom use interventions for middle-aged and older adults over the longer-term. The adoption of psychometrically sound standardised measures of condom use intentions and behaviour is also recommended; triangulation of self-report data with objective markers of risky sexual behaviour would further strengthen studies (Schroder, Carey, & Venable, 2003).

### *Implications for practice*

As preliminary studies of condom use interventions for middle-aged and older adults suggest that they have limited capacity to assist with sexual risk-reduction, it is difficult to

make any concrete recommendations as to the particular approaches that healthcare professionals should take to effect significant behaviour change. More research, as detailed above, is required before clearer guidance for practice is possible.

## **Limitations**

It is possible that, even with a comprehensive search strategy, relevant studies were overlooked. Caution is recommended when interpreting results as the review contained few studies with a total of 565 participants. Ideally, the evidence base of core intervention components would have been analysed using meta-regression, but the small number of included studies prevented this. Furthermore, as only one intervention was classified as effective, the review relied on descriptive statistics (as opposed to analytic techniques other than meta-regression) to examine associations between effectiveness and theoretical basis, BCTs, mode of delivery, and treatment fidelity; thus, further exploration is required. Additionally, the links between core intervention components, such as BCTs and other factors, that could influence intervention outcomes were not considered; results obtained by Lovejoy et al. (2011), where the major difference in the core components of the two interventions tested was intensity (single-session or four-sessions), suggest that this is an avenue for future investigation.

The review was hampered by poor reporting in included studies. Information about theoretical basis and treatment fidelity was often unclear and descriptions of intervention and control content often lacked clarity and depth; this made coding challenging. Furthermore, as BCTs were only coded when there was evidence in accordance with definitions provided in the BCTT (see Michie et al., 2013); the BCTs identified may not accurately reflect all BCTs that were delivered. Additional sources were used to code BCTs in

the interventions evaluated by Lovejoy et al. (2011) and it is possible that had more information been available for the other three interventions, the number of BCTs identified in them may have increased.

Review-level recommendations regarding effectiveness that are based on incomplete accounts of core intervention components are potentially misleading. Thus, authors of future studies are encouraged to follow the current drive in behavioural medicine and improve reporting of all aspects of interventions (Michie, Fixsen, Grimshaw, & Eccles, 2009) and their control counterparts (Michie, Prestwich, & Bruin, 2010).

## **Conclusions**

There is a dearth of condom use interventions for middle-aged and older adults. Overall, when taking into account the limited evidence base and poor quality of studies therein, it can be concluded that there is insufficient evidence to claim that existing condom use interventions targeted at this population are effective. Although findings represent the best initial step toward establishing the core intervention components related to effectiveness; definitive conclusions regarding use of theory, BCTs, mode of delivery, and treatment fidelity cannot be reached. However, they suggest an urgent need, particularly in the UK, to develop theory-based interventions targeting condom use among middle-aged and older adults and evaluate these in RCTs that are rigorously designed and reported. Health psychologists are well placed to play a key role in this endeavour.



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